ACIDS and BASES

Name ____________

Complete the following chart recording your observations as you perform the following tests on some common substances.

Place a small amount of each substance in a testing well. Repeat as needed.

a. Place a small amount of magnesium ribbon in each well.
b. Test each substance with blue litmus, red litmus and pH paper.
c. Add a few drops of cabbage juice to each substance
d. Add a small amount of phenolphthalein to each substance.

	Magnesium	Red Litmus	Blue Litmus	pH paper	Cabbage Juice	Phenol-phthalein	Acid or Base?
Hydrochloric Acid							
Lemon Juice							
Vinegar							
Bottled Water							
Tap Water							
Sierra Mist							
Milk							
Dish Soap							

ACIDS and BASES

Read and highlight the selection below:

ACIDS AND BASES ARE EVERYWHERE

Every liquid you see will probably have either acidic or basic traits. One exception might be distilled water. Distilled water is just water. That's it. The positive and negative ions in distilled water are in equal amounts and cancel each other out. Most water you drink has ions in it. Those ions in solution make something acidic or basic. In your body there are small compounds called amino acids. Those are acids. In fruits there is something called citric acid. That's an acid, too. But what about baking soda? When you put that in water, it creates a basic solution. Vinegar? Acid.

Scientists use something called the **pH scale** to measure how acidic or basic a liquid is. The "p" stands for potential and the "H" stands for Hydrogen. Although there may be many types of ions in a solution, pH focuses on concentrations of hydrogen ions (H+) and hydroxide ions (OH-). The scale goes from values very close to 0 through 14. Distilled water is 7 (right in the middle). Acids are found between a number very close to 0 and 7. Bases are from 7 to 14. Most of the liquids you find every day have a pH near 7. They are either a little below or a little above that mark. When you start looking at the pH of chemicals, the numbers go to the extremes.

NAMES TO KNOW

Here are a couple of definitions you should know:
Acid: A solution that has an excess of H+ ions. It comes from the Latin word acidus that means "sharp" or "sour".
Base: A solution that has an excess of OH- ions. Another word for base is alkali.
Strong Acid: An acid that has a very low pH (0-4).
Strong Base: A base that has a very high pH (10-14).
Weak Acid: An acid that only partially ionizes in an aqueous solution. That means not every molecule breaks apart. They usually have a pH close to 7 (3-6).
Weak Base: A base that only partially ionizes in an aqueous solution. That means not every molecule breaks apart. They usually have a pH close to 7 (8-10).
Neutral: A solution that has a pH of 7. It is neither acidic nor basic.

WHAT REALLY HAPPENS

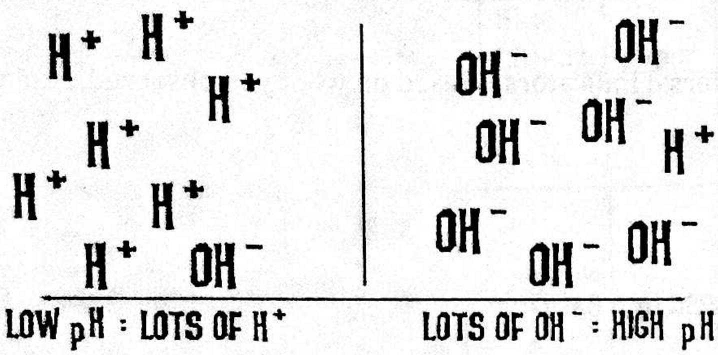
What really happens in those solutions? It gets a little tricky here. We'll give you the straight answer. Acids are compounds that break into hydrogen (H+) ions and another compound when placed in an aqueous solution. Bases are compounds that break up into hydroxide (OH-) ions and another compound when placed in an aqueous solution.

Let's change the wording a bit. If you have an ionic compound and you put it in water, it will break apart into two ions. If one of those ions is H+, the solution is acidic. If one of the ions is OH-, the solution is basic. There are other ions that make acidic and basic solutions, but we won't be talking about them here.

That pH scale we talked about is actually a measure of the number of H+ ions in a solution. If there are a lot of H+ ions, the pH is very low. If there are a lot of OH- ions, that means the number of H+ ions is very low, so the pH is high.

ACIDS and BASES

Think about it for a second. Why would a liquid with high levels of NaOH be dangerous and very basic? The Na-OH bond breaks in solution and you have sodium ions (+) and hydroxide ions (-). The sodium ions don't really pose a danger in solution, but there are a huge number of hydroxide ions in solution compared to the hydrogen ions. All of those excess OH- ions make the pH super-high and the solution will readily react with many compounds. The same thing happens on a less dangerous scale when you add baking soda to water. OH- ions are released in the solution. The numbers of OH- are greater than the H+ and the pH decreases.



A universal indicator is a solution which undergoes several color changes over a wide range of pH's. The color is used to "indicate" pH directly. Universal indicators are usually mixtures of several indicators.

The easiest universal indicator to prepare is red cabbage juice. Stew red cabbage in water and pour off the water for use as an indicator solution. The pigment in red cabbage juice is **anthocyanin**, which changes color from red in acid solution to purplish to green in mildly alkaline solution to yellow in very alkaline solution.

Define an acid in term of ions:

Name some characteristics of acids:

Define a base in term of ions:

Name some characteristics of bases:

ACIDS and BASES

What does pH stand for?

What is the pH scale measuring? (Be specific, I know it tells if something is an acid or a base.)

pH paper and cabbage juice are considered universal indicators? Based on what you observed, explain why.

Identify which characteristics are related to an acid or a base?

a. taste sour
b. Releases OH ions
c. feels slippery
d. Releases H+ ions
e. turns pink in phenolphthalein
f. Reacts with metals to form a hydrogen gas
g. tastes bitter
h. turns red cabbage juice green

Lemon juice, curdled milk, and vinegar all taste sour? What other characteristics would you expect them to share?